Journal of Cardiovascular Disease Research

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 01, 2022

# A COMPARATIVE ANALYSIS OF HORIZONTAL CORNEAL DIAMETER IN PREMATURE AND FULL-TERM INFANTS

**Kalleshwar K P[1], Bhanushree G[2], P Lavanya[3]**

[1]Assistant Professor, Department of Ophthalmology, SIMSRH, Karnataka, India.
[2] Assistant Professor, Department of Ophthalmology, SIMSRH, Karnataka, India.
[3]Associate Professor, Department of Ophthalmology, SIMSRH, Karnataka, India.

Received Date: 12/11/2021 Accepted: 15/12/2021 Published: 09/01/2022

**Corresponding Author:** Dr Bhanushree G, Assistant Professor, Department of Ophthalmology, SIMSRH, Karnataka, India.
**Email:** bhanuophthal@gmail.com

## ABSTRACT

**Background:** To compare horizontal corneal diameter RIN premature and mature infants. **Methods:** A prospective cross sectional study was conducted on 122 eyes from 61 infants both premature and mature newborn babies born during the period from May 2021 to October 2021 with a gestational age between 28 weeks to 38 weeks and birth weight ranging from 1100grms to 4500 grms. **Results:** Corneal diameter was highly associated ($p < 0.001$) with gestational age and birth weight. The corneal diameter was measured in 61 healthy infants 33 premature and 28 mature healthy infants with gestational ages ranging from 28 to 38 weeks, mean gestational age weeks 33.3± SD 2.98, the mean weight in Kilograms 2.26 ± SD 1.54 and mean horizontal corneal diameter in millimeter was 9.57 ± S D 0.84. The corneal diameter ranged from 8mm to10.5 mm. The smallest diameter (8mm) was found in an infant with a gestational age of 28 weeks and having a birth weight of 1100 g. The largest diameter (10.5 mm) was seen in three infants with a gestational age of 36 to 38 weeks and a birth weight of 3000 g to 4500 g. **Conclusions:** These data underline the importance of the corneal size in the diagnosis of developmental glaucoma or megalocornea or microcornea.

**Keywords:** Glaucoma, Gestational age, Horizontal corneal diameter, matures infants, premature**.**

## INTRODUCTION

The horizontal corneal diameter plays a crucial role in diagnosing primary infantile glaucoma, microcornea, and megalocornea. An increase in horizontal corneal diameter accompanied by corneal opacity is the most prominent indicator of primary infantile glaucoma. At birth, both the horizontal and vertical diameters are relatively large, measuring approximately 10 mm, and they reach adult dimensions by the ages of 1 to 3 years. The initial six months are critical for corneal growth. The cornea of a newborn is steeper than that of an adult and typically exhibits greater curvature at the periphery than at the center. Premature infants face a heightened risk of visual impairment, refractive errors, strabismus, and retinopathy of prematurity. Additionally, a normally sized cornea with cloudiness can be observed in various other conditions, including sclerocornea, Peter's anomaly, and congenital hereditary endothelial dystrophy. In some cases, premature neonates may be born with a cloudy cornea, making the measurement of horizontal corneal diameters essential for determining whether the cornea is pathologically enlarged.

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## METHODOLOGY

This study was conducted in the Department of Ophthalmology and the Department of Paediatrics. It was a cross-sectional study carried out over a six-month period. The subjects of the study included all healthy premature and mature infants born during this timeframe, with gestational ages ranging from 28 to 38 weeks and birth weights between 1100 grams and 4500 grams. The author measured the horizontal corneal diameter of the eyes of 33 premature and 28 mature infants (N=61), regardless of gender. The corneal diameter was assessed in both eyes, but one eye was randomly selected—either the right or left—for statistical analysis. Measurements (horizontal diameter, white to white) were taken during the first week of life for both male and female infants (Table 1). A caliper was utilized for these measurements (Fig 1), and no lid retractor was necessary; gentle manipulation was adequate to separate the eyelids. The caliper readings were converted to millimeters using a set of finely graduated precision rulers, with measurements rounded to the nearest 0.25 mm. Almost all measurements were performed by a single investigator. Neonates exhibiting ocular pathology, somatic anomalies, or with indeterminate gestational ages were excluded from the study.

Data complied was entered into M S Excel work sheet and analyzed using R tool. The data were expressed in the form of percentages, mean and standard deviations. Chi - square test was applied to test the test of significance at $p < 0.001$ which was considered as level of significance.

## RESULTS

Corneal diameter exhibited a significant correlation ($p < 0.001$) with both gestational age and birth weight. For reference, graphs illustrating the relationship between corneal diameter, gestational age, and birth weight, along with the 95% confidence intervals for our individual measurements, are included. The corneal diameter was assessed in a cohort of 61 healthy infants, comprising 33 premature and 28 mature infants (see Table II), with gestational ages spanning from 28 to 38 weeks. The average gestational age was 33.3 weeks (± SD 2.98), the mean weight was 2.26 kilograms (± SD 1.54), and the mean horizontal corneal diameter measured 9.57 millimeters (± SD 0.84). The corneal diameter varied between 8 mm and 10.5 mm. The smallest measurement of 8 mm was recorded in an infant born at 28 weeks of gestation with a birth weight of 1100 g. Conversely, the largest measurement of 10.5 mm was observed in three infants with gestational ages ranging from 36 to 38 weeks and birth weights between 3000 g and 4500 g (refer to Table III).


**Figure 1: Caliper.**

**Table I: Age & gender wise distribution of the study population**

| Agein days | Male (%) | Female (%) | Total (%) |
|---|---|---|---|
| 3-5 | 20(76.9) | 28(80) | 48(78.7) |
| 5-7 | 06(23.1) | 07(20) | 13(21.3) |
| Total | 26(42.6) | 35(57.4) | 61(100) |

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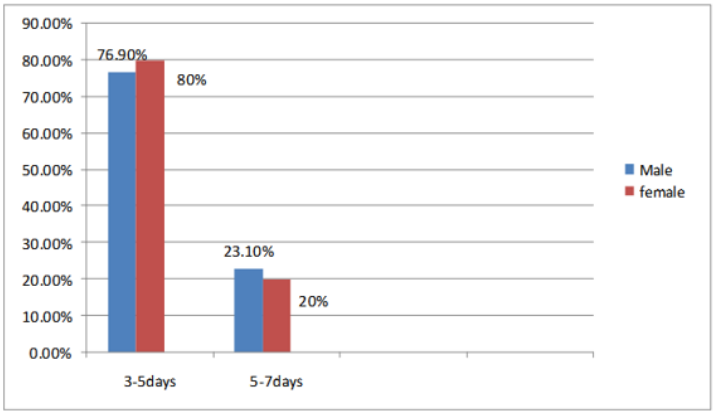


**Figure 2**

Out of 61 study subjects,35(57.4%)were female infants and 26(42.6%)were male infants Majority of them were in 3-5 days of age (78.7%).

**Table II: Horizontal corneal diameter among premature and mature infants.**

| **Term** | **Horizontal corneal diameter in milli metre** | | **Total(%)** |
|---|---|---|---|
| | **8-9.9(%)** | **≥10mm(%)** | |
| Pre term | 31(93.3) | 02(06.1) | 33(54.1) |
| Full term | 14(50.0) | 14(50.0) | 28(45.9) |
| Total | 45(73.8) | 16(26.2) | 61(100) |

X2=7.5,df=1,p<0.001

The proportion of pre term infants was 33(54.1%) and full term 28(45.9%). Among the pre term infants 31(93.3%) of them had the horizontal corneal diameter of 8- 9.9mmand only 02(06.1%) with horizontal corneal diameter of more than or equal to 10mm. In full term infants there was equal distribution of study subjects in both the groups. The observed difference was statistically highly significant at p<0.001

**Table III: Gestational age and Birth weight of the study subjects**

| Term | | | | Total (%) |
|---|---|---|---|---|
| | 1-2(%) | 2-3(%) | ≥3-4(%) | |
| Pre term infants | 31(93.9) | 02(6.1) | -- | 33(54.1) |
| Full term infants | 01(3.6) | 24(85.7) | 03(10.7) | 28(45.9) |
| Total | 32(52.5) | 26(42.6) | 03(4.9) | 61(100) |

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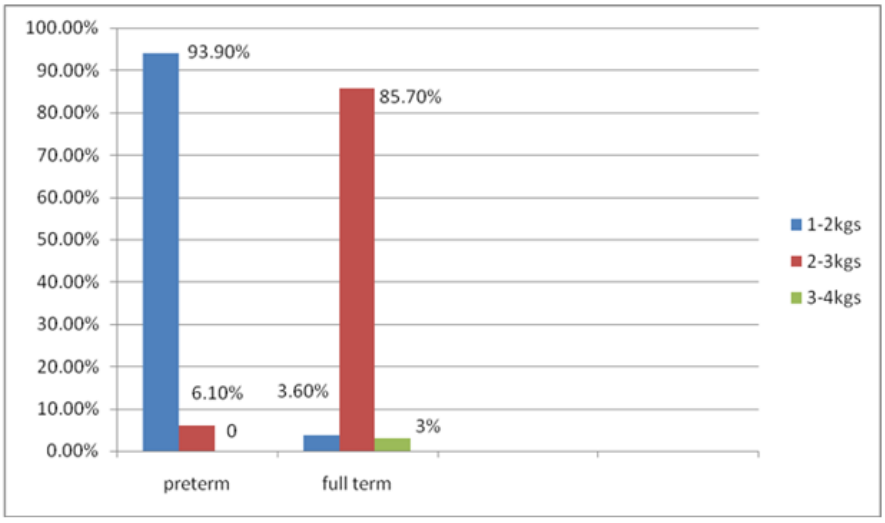


**Figure 3**

Out of33 pre term infants, 93.9% had their birth weight ranging with1-2kgs, 6.1% with2-3kgs. While among 28fullterminfants,85.7%hadtheirbirthweightrangingfrom2-3kgs,10.7%had morethanorequalto3-4kgs and only 3.6% had their birth weight ranging between 1-2kgs.

## DISCUSSION

The mean horizontal diameter of human cornea at birth is reported to be 10.0mm [3] With regard to the corneal diameter of premature infants no data are available in the literature. According to this study in 33 premature babies and 28 mature babies with gestational ages between 28 to 38 weeks the corneal diameter ranged from a minimum of 8.0 mm to a maximum of 10.5 mm. There was an association between corneal diameter and gestational age which is statistically highly significant.

The walls of neonatal eyes, especially fetal eyes, are distended by an increased intraocular pressure because the corneal and sclera collagen has not yet sufficiently hardened[4] Before the age of 6 months the rigidity of the corneal is less than that of the sclera; consequently the cornea enlarges more rapidly under the influence of an increased IOP.[5] Secretion of aqueous humor presumably begins before birth as suggested by the findings of some degree of aqueous drainage effective by 17-18 weeks of fetal life.[6} Fetal facility of out flow correlates directly with the diameter of the cornea.[7] The existence of a fetal aqueous humor circulation has recently been corroborated by a scanning electron microscopy study showing that by 18-22 weeks of development the presence of a well formed gap system connecting the anterior chamber with the developing intertrabecular spaces.[6] These data underline the importance of the corneal size in the diagnosis of developmental glaucoma in premature neonates. Since the data are relatively few, an effort was made with an objective to compare the horizontal corneal diameter in premature and mature infants.

## CONCLUSION

A statistically significant association was observed among corneal diameter, gestational age, and birth weight. Understanding the normal corneal diameter in children across various gestational ages and birth weights is particularly important in rural and semi-urban areas, where the prevalence of the condition is higher and often apparent at birth.

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